

Amendments to the Claims:

This listing of claims will replace all prior versions and listings of claims in the application:

1. (Currently amended) A method of reducing echoes and noise in data, the method comprising:

receiving data;
linearly filtering the data to produce pre-noise suppression data;
removing noise from the pre-noise suppression data to provide noise suppressed data;
dynamically determining at least one weighted filter coefficient using at least in part the pre-noise suppression data and not the noise suppressed data, the determining occurring independently from and not being affected by removing the noise from the pre-noise suppression data;

wherein removing the noise occurs independently from and is not affected by dynamically determining the at least one weighted coefficient such that the noise is removed without encountering an artificial variation in a noise floor; and

subsequently filtering echoes from the noise suppressed data using the at least one weighted filter coefficient to produce final data, the final data being substantially free of noise and substantially free of echoes

An echo-canceler circuit comprising:

pre-noise suppression logic operative to receive pre-echo canceler uplink data and downlink data and in response to produce pre-noise suppression uplink data;

noise suppression logic, operatively coupled to the pre-noise suppression logic, and operative to receive the pre-noise suppression uplink data and in response to produce noise suppressed uplink data;

echo-canceler coefficient logic, operatively coupled to the pre-noise suppression logic, and operative to receive the pre-noise suppression uplink data and the pre-echo canceler uplink data and in response to produce filter coefficient data, the echo-canceler coefficient logic operative to receive the pre-noise suppression uplink data from the pre-noise suppression logic, wherein the pre-noise suppression uplink data used by the echo-canceler coefficient logic to produce the filter coefficient data has not been processed in the noise suppression logic; and
an echo-canceler filter, operatively coupled to the noise suppression logic and to the

~~echo canceler coefficient logic, and operative to receive the noise suppressed uplink data and the filter coefficient data and in response to produce final uplink data.~~

2. (Currently amended) The method of claim 1 further comprising providing the final data to a transceiver for transmission

~~echo canceler circuit of claim 1 wherein the pre-noise suppression logic includes a pre-noise suppression echo canceler adaptive filter.~~

3. (Currently amended) The method of claim 1 wherein receiving data comprises receiving data from a microphone

~~echo canceler circuit of claim 1 wherein the pre-echo canceler uplink data includes echo component data, such that the echo canceler filter produces the final uplink data with reduced echo component data.~~

4. (Currently amended) The method of claim 1 further comprising performing a telemetric function, the function selected from the group consisting of performing a remote engine diagnostic function; tracking a vehicle location; and providing roadside assistance.

~~echo canceler circuit of claim 1 wherein the pre-echo canceler uplink data includes echo component data and noise component data, such that the final uplink data includes reduced echo component data and reduced noise component data.~~

5. (Currently amended) An echo canceler circuit apparatus comprising:
pre-noise compression logic, the logic being configured to linearly filter the data to produce pre-noise suppression data;
noise suppression logic coupled to the pre-noise compression logic and being configured to remove noise from the pre-noise suppression data and provide noise suppressed data;

a filter coefficient generator coupled to the pre-noise suppression logic, the generator configured to dynamically determine at least one weighted filter coefficient using at least in part the pre-noise suppression data and not the noise suppressed data, the determination occurring independently from and not being affected by removal of the noise from the pre-noise

suppression data by the noise suppression logic;

wherein the removal of the noise in the noise suppression logic occurs independently from and is not affected by dynamically determining the at least one weighted coefficient such that the noise is removed without encountering an artificial variation in a noise floor; and

an echo canceler filter coupled to the noise suppression logic and the generator, the echo canceler filter configured to filter echoes from the noise suppressed data using the at least one weighted filter coefficient to produce final data at an output, the final data being substantially free of noise and substantially free of echoes

pre-noise suppression logic operative to receive pre-echo canceler uplink data and downlink data and in response to produce pre-noise suppression uplink data;

noise suppression logic, operatively coupled to the pre-noise suppression logic and operative to receive the pre-noise suppression uplink data and in response to produce noise suppressed uplink data;

echo canceler coefficient logic, operatively coupled to the pre-noise suppression logic, echo canceler coefficient logic comprising:

a filter coefficient data generator operative to receive the pre-echo canceler uplink data and post-echo canceler uplink data and in response to produce echo estimation data and filter coefficient data, and

adder logic, operatively coupled to the pre-noise suppression logic and to the filter coefficient data generator and operative to receive the pre-noise suppression uplink data and the echo estimation data and in response to provide the post-echo canceler data to the filter coefficient data generator, the adder logic operative to receive the pre-noise suppression uplink data from the pre-noise suppression logic, wherein the pre-noise suppression uplink data used by the adder logic to produce the post-echo canceler data for the filter coefficient data generator has not been processed in the noise suppression logic; and

an echo canceler filter, operatively coupled to the noise suppression logic and to the filter coefficient data generator, and operative to receive the noise suppressed uplink data and the filter coefficient data and in response to produce final uplink data.

6. (Currently amended) The echo canceler circuit apparatus of claim 5
wherein the final data is provided to a transceiver for wireless transmission

wherein the pre-noise suppression logic includes:

a pre-noise suppression coefficient data generator operative to receive the downlink data and in response to produce pre-noise suppression coefficient data;

a pre-noise suppression filter, operatively coupled to the pre-noise suppression coefficient data generator, and operative to receive the pre-noise suppression coefficient data and in response to produce pre-noise suppression echo estimation data; and

pre-noise suppression adder logic, operatively coupled to the pre-noise suppression filter and to the adder logic, and operative to receive the pre-echo canceler uplink data and the pre-noise suppression echo estimation data and in response to produce the pre-noise suppression uplink data.

7. (Currently amended) The echo canceler circuit apparatus of claim 5

wherein the data comprises data from a microphone

including:

a digital to analog converter operative to receive the downlink data and in response to produce a downlink audio signal;

an amplifier, operatively coupled to the digital to analog converter, and operative to receive the downlink audio signal and in response to produce an amplified downlink audio signal;

a microphone operative to receive at least a portion of the amplified downlink audio signal and in response to produce a pre-echo canceler uplink signal; and

an analog to digital converter, operatively coupled to the microphone, the pre-noise suppression logic, and to the filter coefficient data generator, and operative to receive the pre-echo canceler uplink signal and in response to produce the pre-echo canceler uplink data.

8. (Currently amended) The echo canceler apparatus of claim [[7]] 5

wherein the apparatus is configured to perform a telemetric function, the function selected from the group consisting of performing a remote engine diagnostic function; tracking a vehicle location; and providing roadside assistance

further including at least one speaker, operatively coupled to the amplifier, and operative to receive the amplified downlink audio signal and in response to produce a downlink

acoustic signal, and wherein the microphone produces the pre-echo canceler uplink signal in response to the downlink acoustic signal.

9. (Currently amended) A method of reducing echoes and noise in data, the method comprising:

receiving data;

removing noise from the data to provide noise suppressed data that is substantially free of noise; and

subsequently filtering echoes from the noise suppressed data using at least one weighted filter coefficient to produce final data, the at least one weighted filter coefficient determined independently from and not being affected by removing the noise, the final data being substantially free of noise and substantially free of echoes

A communication apparatus comprising: a housing having coupled therewith:

an echo canceler circuit within the housing including:

pre-noise suppression logic operative to receive pre-echo canceler uplink data and downlink data and in response to produce pre-noise suppression uplink data;

noise suppression logic, operatively coupled to the pre-noise suppression logic, and operative to receive the pre-noise suppression uplink data and in response to produce noise suppressed uplink data;

echo canceler coefficient logic, operatively coupled to the pre-noise suppression logic, and operative to receive the pre-noise suppression uplink data and the pre-echo canceler uplink data, and in response to produce filter coefficient data, the echo canceler coefficient logic operative to receive the pre-noise suppression uplink data from the pre-noise suppression logic, wherein the pre-noise suppression uplink data used by the echo canceler coefficient logic to produce the filter coefficient data has not been processed in the noise suppression logic;

an echo canceler filter, operatively coupled to the noise suppression logic and to the echo canceler coefficient logic, and operative to receive the noise suppressed uplink data and the filter coefficient data and in response to produce final uplink data; and

a transceiver, operatively coupled to the echo canceler filter and to the pre-noise suppression logic, and operative to receive the final uplink data from the echo canceler filter and in response to transmit the final uplink data, and to provide the downlink data to the pre-noise suppression logic.

10. (Currently amended) The method of claim 9 further comprising providing the final data to a transceiver for transmission

~~The communication circuit of claim 9 wherein the transceiver is at least one of a wireless wide area network (WWAN) transceiver, a wireless local area network (WLAN) transceiver and a wireless device.~~

11. (Currently amended) The method of claim 9 wherein receiving data comprises receiving data from a microphone

~~The communication circuit of claim 9 wherein the pre-echo canceler uplink data includes echo component data and noise component data, such that the final uplink data includes reduced echo component data and reduced noise component data.~~

12. (Currently amended) The method of claim 9 further comprising performing a telemetric function, the function selected from the group consisting of performing a remote engine diagnostic function; tracking a vehicle location; and providing roadside assistance
The communication apparatus of claim 10 further including a location information generator operative to produce location information, wherein the echo canceler circuit includes:
one or more processing devices operatively coupled to the location information generator; and
memory containing instructions executable by the one or more processing devices to cause the one or more processing devices to receive the location information and in response to provide the location information to the transceiver, wherein the transceiver transmits the location information.

13. (Currently amended) A method of reducing echoes and noise in data, the method comprising:
receiving data that is substantially free from noise; and
subsequently filtering echoes from the data using at least one weighted filter coefficient to produce final data, the at least one weighted filter coefficient determined independently from and not being affected by removing the noise, the final data being substantially free of noise and substantially free of echoes

An in-vehicle communication system comprising: an echo canceler circuit comprising:

pre-noise suppression logic operative to receive pre-echo canceler uplink data and downlink data, and in response to produce pre-noise suppression uplink data;

noise suppression logic, operatively coupled to the pre-noise suppression logic, and operative to receive the pre-noise suppression uplink data and in response to produce noise suppressed uplink data;

echo canceler coefficient logic, operatively coupled to the pre-noise suppression logic, and operative to receive the pre-noise suppression uplink data and the pre-echo canceler uplink data, and in response to produce filter coefficient data, the echo canceler coefficient logic operative to receive the pre-noise suppression uplink data from the pre-noise suppression logic, wherein the pre-noise suppression uplink data used by the echo canceler coefficient logic to produce the filter coefficient data has not been processed in the noise suppression logic;

an echo canceler filter, operatively coupled to the noise suppression logic and to the echo canceler coefficient logic, and operative to receive the noise suppressed uplink data and the filter coefficient data and in response to produce final uplink data;

a wireless transceiver, operatively coupled to the echo canceler filter and to the pre-noise suppression logic, and operative to receive the final uplink data from the echo canceler filter and in response to transmit the final uplink data, and

to receive the downlink data and in response to provide the downlink data to the pre-noise suppression logic;

an audio system including:

an amplifier, operatively coupled to the wireless transceiver and to the pre-noise suppression logic, and operative to receive the downlink data, and in response, to produce an amplified downlink audio signal; and

a playback module including at least one of: a tuner module, a tape player, a CD player and a DVD player, operatively coupled to the amplifier, and operative to provide at least a playback audio signal to the amplifier.

14. (Currently amended) The method of claim 13 further comprising providing the final data to a transceiver for transmission

The in-vehicle communication system of claim 13 wherein the wireless transceiver is at least one of a wireless wide area network transceiver, a wireless local area network

transceiver and a wireless device.

15. (Currently amended) The method of claim 13 wherein receiving data comprises receiving data from a microphone

~~The in-vehicle communication system of claim 13 wherein the pre-noise suppression logic includes a pre-noise suppression echo canceler adaptive filter.~~

16. (Currently amended) The method of claim 13 further comprising performing a telemetric function, the function selected from the group consisting of performing a remote engine diagnostic function; tracking a vehicle location; and providing roadside assistance

~~The in-vehicle communication system of claim 13 wherein the pre-echo canceler uplink data includes echo component data, such that the echo canceler filter produces the final uplink data with reduced echo component data.~~

17. (Currently amended) The method of claim 13 wherein the data is received from the communication system of a vehicle

~~The in-vehicle communication system of claim 13 wherein the pre-echo canceler uplink data includes echo component data and noise component data, such that the final uplink data includes reduced echo component data and reduced noise component data.~~

18-23. (Canceled)

24. (New) An echo canceler circuit comprising:

pre-noise suppression logic operative to receive pre-echo canceler uplink data and downlink data and in response to linearly filter the pre-echo canceler uplink data and the downlink data to produce pre-noise suppression uplink data;

noise suppression logic, operatively coupled to the pre-noise suppression logic, and operative to receive the pre-noise suppression uplink data and in response to remove noise from the pre-noise suppression data to produce noise suppressed uplink data;

echo canceler coefficient logic, operatively coupled to the pre-noise suppression logic,

and operative to receive the pre-noise suppression uplink data and the pre-echo canceler uplink data and in response to produce filter coefficient data, the echo canceler coefficient logic operative to receive the pre-noise suppression uplink data from the pre-noise suppression logic, wherein the pre-noise suppression uplink data used by the echo canceler coefficient logic to produce the filter coefficient data has not been processed in the noise suppression logic;

wherein the noise suppression logic operates independently from and is not affected by the operation of the echo canceler coefficient logic such that the noise is removed without encountering an artificial variation in a noise floor; and

an echo canceler filter, operatively coupled to the noise suppression logic and to the echo canceler coefficient logic, and operative to receive the noise suppressed uplink data and the filter coefficient data and in response to filter echoes from the noise suppressed uplink data using the filter coefficient data to produce final uplink data, the final uplink data being substantially free of noise and substantially free of echoes.